Dr. Ivo Sbalzarini,

MOSAIC Group, Center for Systems Biology Dresden.
Chair of Scientific Computing for Systems Biology, Faculty of Computer Science, TU Dresden
& Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany.

URL: http://mosaic.mpi-cbg.de/?q=people/ivo_sbalzarini

Title: Model-based Image Analysis for Fluorescence Microscopy

Abstract:
Over the past years, we have developed a toolbox of methods for segmentation and tracking of fluorescence microscopy images. These methods are continuous and based on (bio-)physical models of the imaged specimen and of the imaging process. Such model-based image analysis provides a number of advantages, such as sub-pixel accuracy, versatility, and robustness. We show how the model-based formalism can be used to derive globally optimal segmentation results that asymptotically reach the information-theoretic bound of how well any method could possibly do on a given image. We further show how model-based approaches can be used to derive image priors for tasks such as image denoising, deconvolution, dehazing, or contrast enhancement. Combining the pieces may enable us to address the salient problem of uncertainty quantification in image analysis in a principled way. We discuss the opportunities and issues, and present the user-friendly MOSAICsuite for ImageJ/Fiji as a software implementation of the presented toolbox.